CLAIMS

What is claimed is:

1. A cooling apparatus, comprising:

a compressor, a condenser, a first expanding unit, a second expanding unit, a third expanding unit, a first evaporator, and a second evaporator;

a first refrigerant circuit containing refrigerant discharged from the compressor and flowing into a suction side of the compressor through the condenser, the first expanding unit, the first evaporator, the second expanding unit and the second evaporator;

a second refrigerant circuit containing the refrigerant passing through the condenser and flowing into the suction side of the compressor through the third expanding unit and the second evaporator;

a flow path control unit installed at a discharge side of the condenser, switching a refrigerant flow path so that the refrigerant passing through the condenser flows through at least one of the first and second refrigerant circuits; and

a control unit selectively opening and closing the flow path control unit.

2. The cooling apparatus according to claim 1, wherein the control unit generates:

a first cooling mode obtaining two different evaporation temperatures from the first and second evaporators through independent expansion of the refrigerant in the first and second expanding units by controlling the flow path control unit to allow the refrigerant to flow through the first refrigerant circuit; and

a second cooling mode obtaining a single evaporation temperature from the second evaporator through expansion of the refrigerant in the third expanding unit by controlling the flow path control unit to allow the refrigerant to flow through the second refrigerant circuit.

3. The cooling apparatus according to claim 1, wherein the second and third expanding units are constructed so that a depressurization of the refrigerant performed by the second and third expanding units is sufficient to obtain an evaporation temperature required for the second evaporator.

4. The cooling apparatus according to claim 1, wherein at least one of the first, second, and third expanding units is a capillary tube .

5. The cooling apparatus according to claim 1, wherein the second expanding unit is constructed so that an inside diameter thereof is less than that of a refrigerant pipe disposed at the suction side of the compressor.

6. The cooling apparatus according to claim 5, wherein the inside diameter of the second expanding unit is 2 to 4 mm.

7. The cooling apparatus according to claim 1, wherein the control unit is a microprocessor.

8. A method of controlling a cooling apparatus, the cooling apparatus comprising a first refrigerant circuit containing refrigerant discharged from a compressor flowing into a suction side of the compressor through a condenser, a first expanding unit, a first evaporator, a second expanding unit and a second evaporator, a second refrigerant circuit containing the refrigerant passing through the condenser flowing into the suction side of the compressor through a third expanding unit and the second evaporator, a flow path control unit installed at a discharge side of the condenser switching a refrigerant flow path so that the refrigerant passing through the condenser flows through at least one of the first and second refrigerant circuits, a control unit selectively opening and closing the flow path control unit, a first cooling compartment cooled by the first evaporator, and a second cooling compartment cooled by the second evaporator, the method comprising:

cooling both the first and second cooling compartments by controlling the flow path control unit to allow the refrigerant to flow through the first refrigerant circuit; and

independently cooling the second cooling compartment by controlling the flow path control unit to allow the refrigerant to flow through the second refrigerant circuit in response to a temperature of the first cooling compartment reaching a target temperature.

9. The cooling apparatus control method according to claim 8, further comprising stopping an operation of the compressor in response to a temperature of the second cooling compartment reaching a target temperature.

10. The cooling apparatus control method according to claim 9, further comprising supplying compressed refrigerant, which has been previously discharged by the compressor, to the first refrigerant circuit by controlling the flow path control unit to close the second refrigerant circuit and open the first refrigerant circuit in response to the operation of the compressor being stopped.

11. The cooling apparatus control method according to claim 10, wherein the cooling apparatus further comprises a first evaporator fan to blow air surrounding the first evaporator into the first cooling compartment, the control method further comprising:

eliminating frost formed on a surface of the first evaporator by operating the first

evaporator fan for a first predetermined time if a temperature of the first cooling compartment is equal to or less than a predetermined temperature after the first refrigerant circuit is opened.

12. The cooling apparatus control method according to claim 11, further comprising opening both the first and second refrigerant circuits in response to the first predetermined time elapsing, thus equalizing pressure of the refrigerant over the entire first and second refrigerant circuits.

13. The cooling apparatus control method according to claim 10, wherein the cooling apparatus further comprises a first defrost heater to eliminate frost formed on a surface of the first evaporator, a first evaporator fan to blow air surrounding the first evaporator into the first cooling compartment, and a second evaporator fan to blow air surrounding the second evaporator into the second cooling compartment, the control method further comprising:

preventing the temperature of the first cooling compartment from decreasing to be equal to or less than the target temperature due to an external temperature of the cooling apparatus by operating the first defrost heater for a first predetermined time if the external temperature is equal to or less than a predetermined temperature after the first refrigerant circuit is opened.

14. The cooling apparatus control method according to claim 13, wherein the predetermined temperature is 15°C.

15. The cooling apparatus control method according to claim 13, wherein the first defrost heater is operated so that a heating temperature thereof is limited to the target temperature or less of the first cooling compartment, thus preventing the temperature of the first cooling compartment from exceeding the target temperature.

16. The cooling apparatus control method according to claim 13, further comprising opening both the first and second refrigerant circuits in response to the first predetermined time elapsing, thus equalizing pressure of the refrigerant over the entire first and second refrigerant circuits.

17. The cooling apparatus control method according to claim 13, wherein the cooling apparatus further comprises a second defrost heater to eliminate frost formed on a surface of the second evaporator and a condenser fan provided in the condenser, the control method further comprising:

opening both the first and second refrigerant circuits by controlling the flow path control unit, and operating the first and second defrost heaters to perform a simultaneous defrosting operation in response to frost being formed on surfaces of both the first and second evaporators

after the compressor has been stopped.

18. The cooling apparatus control method according to claim 17, wherein the control method further comprises decreasing pressure of the refrigerant, which has been increased due to the first and second defrost heaters, to smoothly restart the compressor by operating the first and second evaporator fans and the condenser fan in response to the defrosting operation having been completed and the first and second defrost heaters having been stopped.

19. The cooling apparatus control method according to claim 17, wherein the first and second evaporator fans are not operated while the first and second defrost heaters are operated.

20. The cooling apparatus control method according to claim 9, further comprising operating a second defrost heater while heated refrigerant of the condenser flows into the second evaporator by closing the first refrigerant circuit and opening the second refrigerant circuit in response to frost being formed on a surface of the second evaporator after the compressor has been stopped.

21. The cooling apparatus control method according to claim 20, further comprising opening both the first and second refrigerant circuits to equalize pressure of the refrigerant over the entire first and second refrigerant circuits in response to the independent defrosting operation of the second evaporator having been completed.

22. The cooling apparatus control method according to claim 8, wherein the flow path control unit is operated to allow the refrigerant to flow through the first refrigerant circuit if the cooling apparatus is turned on to be supplied with power, and then allow the refrigerant to flow through the second refrigerant circuit if a cooling operation through the first refrigerant circuit has been completed.

23. The cooling apparatus control method according to claim 8, further comprising:

eliminating frost formed on a surface of the first evaporator by operating a first evaporator fan for a second predetermined time in response an external temperature of the cooling apparatus being equal to or greater than a predetermined temperature when the first refrigerant circuit is closed; and

simultaneously increasing humidity of the first cooling compartment by blowing moisture generated during elimination of frost into the first cooling compartment by operating the first evaporator fan.

24. The cooling apparatus control method according to claim 23, wherein the predetermined temperature is 15°C.

25. The cooling apparatus control method according to claim 8, further comprising:

closing the first refrigerant circuit and opening the second refrigerant circuit in response a cooling time through the first refrigerant circuit being equal to or greater than a first predetermined time during which the temperature of the first cooling compartment does not reach the target temperature;

eliminating frost formed on a surface of the first evaporator by operating a first evaporator fan for a second predetermined time; and

re-starting a cooling operation through the first refrigerant circuit by closing the second refrigerant circuit and opening the first refrigerant circuit again after the second predetermined time has elapsed.

26. A cooling system comprising:

a compressor, a condenser, a first expanding unit, a second expanding unit, a third expanding unit, a first evaporator, and a second evaporator;

a first refrigerant circuit containing refrigerant discharged from the compressor and flowing into a suction side of the compressor through the condenser, the first expanding unit, the first evaporator, the second expanding unit and the second evaporator;

a second refrigerant circuit containing the refrigerant passing through the condenser flowing into the suction side of the compressor through the third expanding unit and the second evaporator; and

a flow path control unit installed at a discharge side of the condenser, switching a refrigerant flow path so that the refrigerant passing through the condenser flows through at least one of the first and second refrigerant circuits.

27. The cooling system of claim 26, further comprising a control unit selectively opening and closing the flow path control unit.

28. The cooling system of claim 27, wherein the control unit is a microprocessor.

29. A refrigerator with a refrigerator compartment and a freezer compartment, the refrigerator comprising:

a compressor;

a condenser;

a first evaporator cooling the refrigerator compartment;

a second evaporator cooling the freezer compartment;

a first refrigerant circuit providing refrigerant to the first evaporator and the second evaporator; and

a second refrigerant circuit providing refrigerant to the second evaporator only;

wherein the first and second refrigerant circuits share a pathway through the compressor, condenser, and second evaporator.

30. The refrigerator of claim 29, wherein the first refrigerant circuit refrigerates a refrigerator compartment and a freezer compartment, and the second refrigerant circuit refrigerates only the freezer compartment.

31. A refrigerator comprising:

a condenser, a compressor, a first expanding unit, a refrigerator compartment evaporator, a second expanding unit, and a freezer compartment evaporator;

wherein the first expanding unit and the second expanding unit are of different inside diameters; and

wherein the first expanding unit depressurizes a refrigerant passing through the refrigerator compartment evaporator, and the second expanding unit further depressurizes the refrigerant before passing through the freezer compartment evaporator.

32. A method of defrosting a refrigerator compartment evaporator comprising:

operating a refrigerator compartment fan in a refrigeration mode cooling only a freezer compartment of a refrigerator; and

increasing the humidity of the refrigerator compartment by blowing moisture generated during the defrosting into the refrigerator compartment.

33. The method of defrosting a refrigerator compartment evaporator of claim 32, further comprising operating a defrost heater with the refrigerator compartment fan.

34. A method of defrosting a refrigerator compartment evaporator comprising operating a refrigerator compartment fan for a predetermined time immediately after an operation of a compressor has stopped.

35. A cooling apparatus comprising:

a first refrigerant circuit comprising a plurality of evaporators, each of the evaporators cooling a respective section along the circuit;

a second refrigerant circuit bypassing at least one of the evaporators, while continuing to circulate refrigerant through a remainder of the evaporators.

a control unit selectively opening and closing the first and second refrigerant circuits according to a time division multi-cycle.